

INTERNATIONAL PRELIMINARY EXAMINATION REPORT  
(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference Jg-3024-PCT	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/GB 03/04088	International filing date (day/month/year) 24.09.2003	Priority date (day/month/year) 25.09.2002
International Patent Classification (IPC) or both national classification and IPC H01S3/067		
Applicant SOUTHAMPTON PHOTONICS LIMITED		

- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 5 sheets, including this cover sheet.  
  
☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).  
  
 These annexes consist of a total of sheets.

- This report contains indications relating to the following items:
  - I ☒ Basis of the opinion
  - II ☐ Priority
  - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
  - IV ☐ Lack of unity of invention
  - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
  - VI ☐ Certain documents cited
  - VII ☐ Certain defects in the international application
  - VIII ☐ Certain observations on the international application

Date of submission of the demand  15.04.2004	Date of completion of this report  24.11.2004
Name and mailing address of the international preliminary examining authority:   European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer  Kloppenburger, M  Telephone No. +31 70 340-2205  

INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT

International application No. PCT/GB 03/04088

## I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

1-14 as originally filed

**Claims, Numbers**

1-20 as originally filed

**Drawings, Sheets**

1/7-7/7 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes: Claims	1-20
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	1-20
Industrial applicability (IA)	Yes: Claims	1-20
	No: Claims	

2. Citations and explanations

**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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Reference is made to the following documents:

- D1: WO-A-0002290 (Richardson D et al), 13 January 2000  
D2: Varnham M P et al, Electronics Letters 19(7), p. 246-247, 31 March 1983  
D3: Wada A, IEICE Transactions On Communications E76-B(4), p. 345-350,  
1 April 1993

1 The present application does not meet the requirements of Article 33(1) PCT, because the subject-matter of the independent claim 1 does not involve an inventive step in the sense of Article 33(3) PCT, for the reasons laid out in the following.

1.1 The document D1 discloses (page 3, line 9-26):

- an optical fibre having a waveguide, configured such that the waveguide supports multiple modes;
- the waveguide comprising a gain medium, the disposition of the gain medium such as to provide preferential guidance to one of the modes.

1.2 The device specified in claim 1 differs from the optical fibre disclosed in document D1 in that it incorporates a stress applying region having a depressed refractive index. These regions induce birefringence in the waveguide due to the stress applied to the waveguide and the modified refractive index profile of the cladding. Thus, preferential guidance of specific polarisation modes can be implemented. The technical problem solved by this feature is to design an optical fibre amplifier that produces light of a single polarisation.

1.3 Single polarisation fibres and fibre amplifiers are well known in the art. It is also well known in the art that such fibres can be obtained by incorporation of stress applying regions, e.g. in PANDA or bow-tie fibres, and that these stress applying regions advantageously have a depressed refractive index (see e.g. document D2). It would therefore be obvious for the person skilled in the art to incorporate such elements into the optical fibre disclosed in document D1 to create a single polarisation optical fibre amplifier. He would thus arrive at an optical fibre device as specified in claim 1.

2 The dependent claims 2-20 do not contain any additional features which, in combination with the features of the claims to which they refer, meet the requirements of the Article 33 PCT with respect to inventive step.

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2.1 Bending the fibre and/or arranging the fibre such that one mode is leaky, as specified in claims 2 and 5, is known e.g. from document D2. Rare earth elements as dopants for the gain medium, as specified in claims 3 and 4, are well known in the art and e.g. disclosed in document D1. A single polarisation fibre as specified in claim 6, or as an optical amplifying device, as specified in claims 18-20, are obvious applications of the claimed optical fibre device. Claims 9 to 12 define numerical apertures of the waveguide corresponding to specific refractive index differences between core and cladding, but no special technical effect is disclosed for these specific values. (Note that document D1 discloses an index difference of less than 0.0030, as specified in claim 10).

2.2 Claims 7, 8, and 13-17 relate to means for increasing the stimulated Brillouin scattering threshold of the optical fibre by tapering, exposition to UV radiation, or heat treatment. These means all amount to modifying stress within the fibre cross-section. However, the suppression of stimulated Brillouin scattering by inducing specific stress profiles in the fibre is well known (see e.g. document D3).